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OPERATOR AND ORGANIZATIONAL MAINTENANCE MANUAL
INCLUDING REPAIR PARTS AND SPECIAL TOOLS LIST

ALARM SET, ANTI-INTRUSION; RESTRICTED AREA, AN/GSQ-151 (DORSETT ELECTRONICS MODELS (PSID))

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DEPARTMENTS OF THE ARMY, THE NAVY,

AND THE AIR FORCE

Washington, D.C., 9 December 1969

ALARM SET, ANTI-INTRUSION; RESTRICTED AREA, AN/GSQ-151 (DORSETT ELECTRONICS MODELS (PSID)

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INTRODUCTION

The Operation and Maintenance Technical Manual provides all essential information required by personnel for operating and maintaining the Anti-Intrusion Alarm Set, Model Number An/GSQ-151.

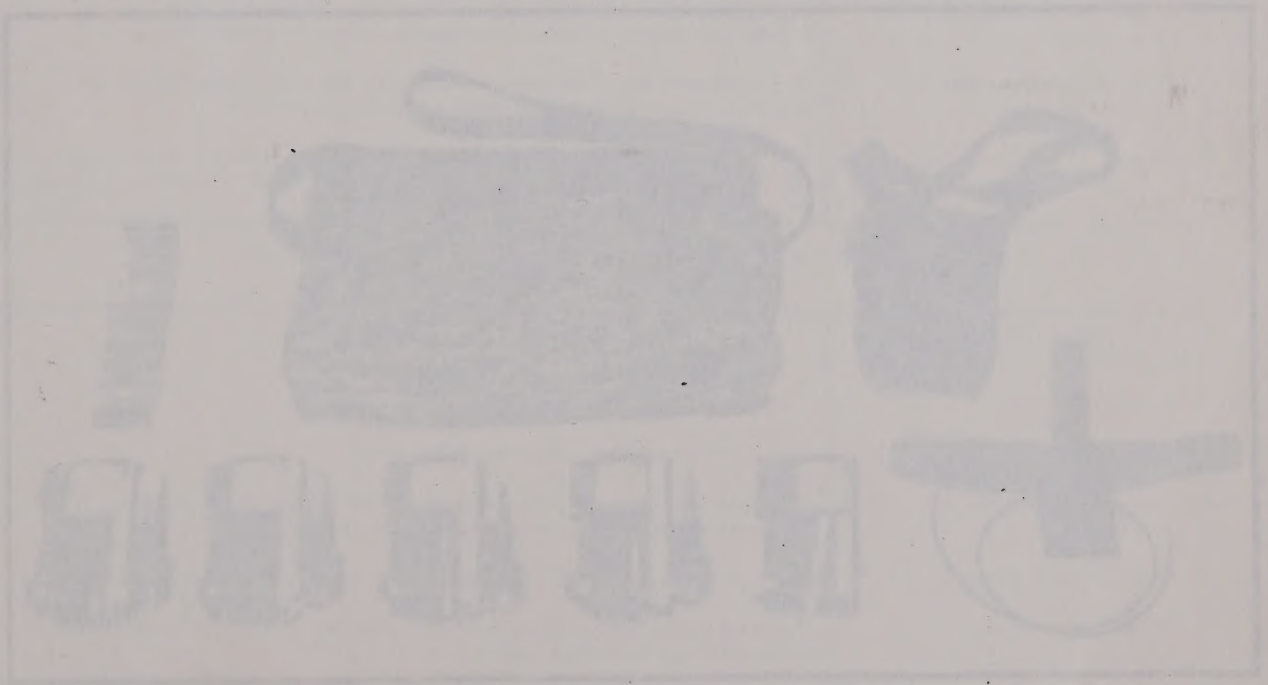
Military Specifications applicable to information contained in this technical manual are as follows:

MIL-STD-202	Test Methods for Electronic and Electrical Component Parts
TM 38-750	Army Equipment Record Procedures

LIST OF ABBREVIATIONS

The following abbreviations are used in this technical manual:

PSID Patrol Seismic Intrusion Detector



SECTION I

DESCRIPTION AND LEADING HIGHLIGHTS

1-1 GENERAL

1-2 This publication contains operating and maintenance instructions with illustrated parts breakdown and deployment drawing for Anti-Intrusion Alarm Set, AN/ GSQ-151.

1-3 PURPOSE OF EQUIPMENT

1-4 The primary function of this equipment is to alert the receiver operator to movement in a given area where observation of movement is desired.

1-5. ALARM SET

1-6 There are six (6) different Anti-Intrusion Alarm Sets, the difference being RF frequency (as shown in Section III). All operating characteristics of each set are identical; and, therefore, discussions presented in this manual will apply to any of the six (6) sets. Each set contains the following equipment, as illustrated in figure 1-1.

One (1)	Alarm Set Carrying Case
One (1)	Receiver Set Carrying Case
Twenty (20)	Batteries (ten are spares)
Four (4)	Detector Sets
One (1)	Receiver Set
One (1)	Headphone
One (1)	Headband

NOTE: Batteries must be ordered separately, see parts list.

1-7 DETECTOR SETS

1-8 The detector sets are sealed, self-contained, waterproof, pulse-amplitude-modulated transmitters. Each detector is a molded plastic case which contains a battery supply, printed wiring board, and on/ off sensitivity switch. Attached to the case is a flexible spring-steel antenna and a geophone with 8 feet of cable. To store the unit, the antenna wraps around the case and is held in place by the geophone cable wrapped around the case over the antenna. The geophone is held in a clip on the side of the case, and the cable is retained by a clip which is placed over one end of the case. The differences in each of the four detectors is defined in a later portion of this manual.

1-9 RECEIVER SET

1-10 The receiver set is a sealed, self-contained, waterproof, pulse-amplitude-modulation receiver.

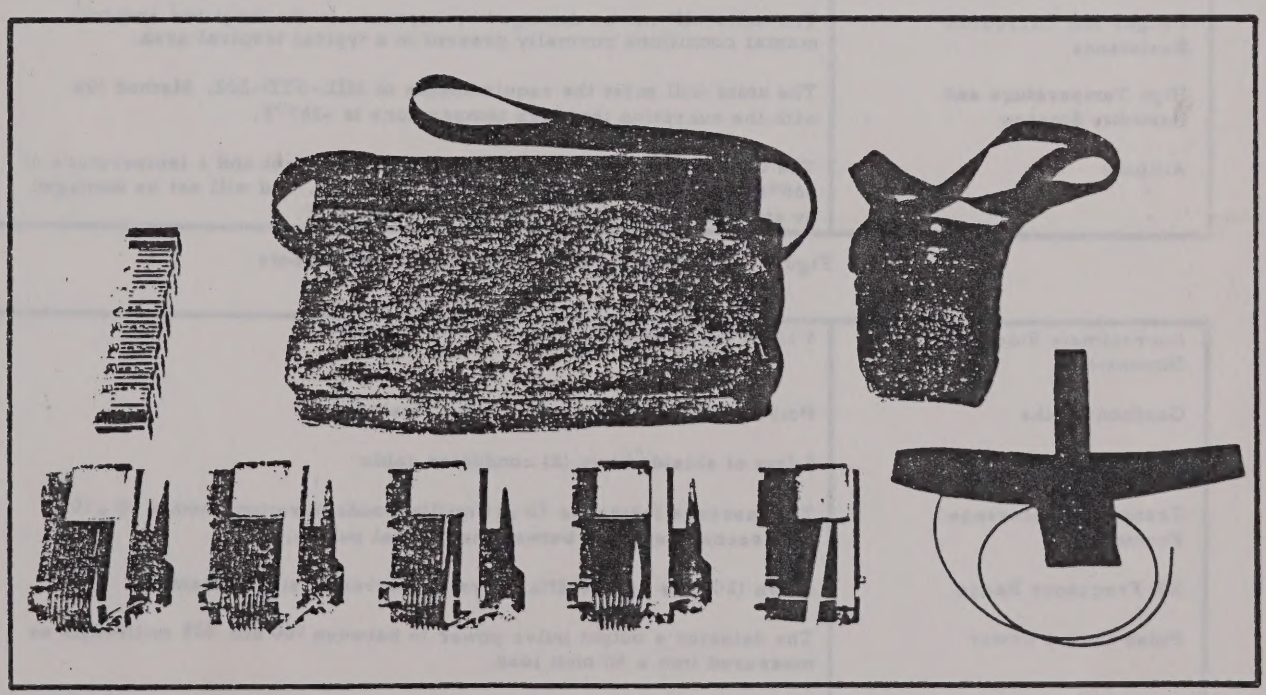


Figure 1-1 Alarm Set, Anti - Intrusion (PSID)

The receiver is a molded plastic case containing a battery supply, printed wiring board, headset connection, and an on-off switch. Attached to the case is a flexible spring-steel antenna. To store this unit, the antenna is wrapped around the case and held in place by a spring clip which is placed over one end of the case. The headset cable can be either coiled up or wrapped around the case; then the receiver, headset, and cable will be placed in the receiver carrying case (shown in figure 1-1).

1-11 HIGHLIGHTS

1-12 The highlights, which apply to both the detector set and receiver set, are presented in figure 1-2. The highlights, which apply only to the detector set, are presented in figure 1-3; the receiver set is presented in figure 1-4.

Case	Cycolac, Grade L, OD Color, Sealed
Antenna	Curled flexible, spring-steel, 24 x 1/2 inch, tapering to 5/32 inches
Battery Supply	Two (2) BA1090/U, 9 Volt DC batteries (if this battery should not be available, any rectangular 9 volt transistor radio battery can be used).
Operating Temperatures Operating Times	The units will operate in ambient temperatures from -22°F. to + 140°F with solar radiation of 360 BTU/ft^2/hr. Battery operational life will vary with temperature (see figure 3-6). Typical operating time at 70°F is 48 hours.
Storage Temperatures	The units will not be damaged by storage in temperatures of +167°F for 8 hours and -65°F for 24 hours. Batteries should be stored in a cool, dry place.
Vibration	The units will withstand vibrations of 10g's over a frequency range of 30Hz to 2,000Hz to 30Hz (logarithmically swept) for a period of 20 minutes.
Mechanical Shock	The units will withstand mechanical shocks of 40g's with a duration of 18 milliseconds sawtooth pulse, in any direction of the three major axes.
Submersion	The units are capable of being submerged in a salt water solution to a depth of 3 feet without damage.
Fungus and Corrosion Resistance	The units will not be damaged by exposure to the fungi and environmental conditions normally present in a typical tropical area.
High Temperature and Humidity Storage	The units will meet the requirements of MIL-STD-202, Method 106 with the exception that high temperature is +167°F.
Altitude	The units will operate at an altitude of 14,000 feet and a temperature of +65°F with solar radiation of 410 BTU/ft^2/hr, and will not be damaged by storage in altitudes of 40,000 feet at -65°F.

Figure 1-2 Highlights of Receiver and Detector Sets

Approximate Storage Dimensions	5 1/2 x 4 x 1 7/8 inches
Geophone Spike	Polycarbonate Plastic, OD Color, Sealed
Geophone Cable	8 feet of shielded two (2) conductor cable
Transmitted Message Format	The message format is 70 ±10 milliseconds duration, with a 50 ±10 milliseconds spacing between individual pulses.
RF Frequency Range	From 120 MHz to 140MHz, crystal controlled single channel.
Pulse Output Power	The detector's output pulse power is between 100 and 425 milliwatts as measured into a 50 ohm load.
Standby Current Drain	The standby current drain of each detector set does not exceed 1.5 ma.

Figure 1-3 Highlights of Detector Sets

Approximate Storage Dimensions	6 X 3 X 2 inches
Headset	Plastic, OD Color, Sealed, with cable attached (the unit is designed for a 15 ohm headset, however, if the standard headset is not available any earphone or small speaker with an impedance of 15 to 60 ohms may be used with a lesser degree of efficiency).
RF Frequency Range	From 120MHz to 140MHz, crystal controlled, single channel
Dynamic Range	The receiver is capable of operating normally with signal inputs between -100dbm and -40dbm into the receiver antenna terminals.
Audio Output	Waterproof, Quick disconnect, small, hermetic, coaxial connector
Recovery Time	The unit will be fully operational at normal sensitivity within 50 milliseconds after application of a 70 millisecond pulse.
Standby Current Drain	The receiver standby current drain does not exceed 10 milliamps

Figure 1-4 Highlights of Receiver Set

SECTION II

TEST EQUIPMENT AND SPECIAL TOOLS

2-1 GENERAL

2-2 This section of the technical manual lists the test equipment and tools required to perform maintenance, and field repairs on the receiver set and the detector sets.

2-3 TEST EQUIPMENT

2-4 Figure 2-1 lists the test equipmant required for the field testing of the receiver set and detector sets.

2-5 SPECIAL TOOLS

2-6 There are no special tools required for repair of the units. The tools listed in figure 2-2 will normally be found in a standard electronics tool box.

NAME	DESCRIPTION	ALTERNATE	USE
Multimeter	AN/PSM-6 FSN 6625-643-1686	Any voltmeter with a 0 to 10 Volt DC Range (sensitivity of 1000 Ω/v min)	Measurement of the battery voltage

Figure 2-1 Test Equipment

NAME	DESCRIPTION	USE
Wrench, Allen	Wrench, Allen, .05 in. FSN 5120-198-5401	Switch Knob Set Screw Replacement
Screwdriver	Standard flat blade screwdriver, 3/16 inch wide nominal	Antenna Mounting Screw Replacement

Figure 2-2 Tools

SECTION III

DEPLOYMENT AND THEORY OF OPERATION

3-1 GENERAL

3-2 This section of the technical manual provides deployment and functional and detail theory of operation discussions of the Anti-Intrusion Alarm Set. It is presented in three (3) parts: (1) Anti-Intrusion Alarm Set, overall operation, (2) Detector Set deployment and operation, and (3) Receiver Set deployment and operation.

3-3 ANTI-INTRUSION ALARM SET

3-4 The anti-intrusion alarm set is composed of five (5) major units, all of which are operating on the same RF frequency; four (4) detector sets, and one (1) receiver set. There are six (6) different anti-intrusion alarm sets, the difference being the RF frequencies (see figure 3-1).

FREQUENCY (MHz)	ANTI-INTRUSION ALARM SET PART NUMBER
126.600	93 A421-1 FSN 6350- 179-1557
127.400	93 A421-2 FSN - -
129.000	93 A421-3 FSN - -
129.900	93 A421-4 FSN - -
133.500	93 A421-5 FSN - -
134.500	93 A421-6 FSN - -

Figure 3-1 Frequency/Alarm Set Part Number

3-5 The receiver can be used with any one (1) or all four (4) detector sets, depending on the area to be covered by one alarm set. Should it be desirable to control more area than one alarm set is capable of covering, additional alarm sets which operate on different RF frequencies may be utilized. If it becomes necessary to use alarm sets which operate on the same RF frequency, they should be placed out of range of each other.

3-6 The alarm set alerts the receiver operator to any personnel or vehicle movement in the area of the detectors sensitivity range. By the code which is received, the receiver operator can determine which detector is transmitting the alarm.

3-7 DETECTOR SETS

3-8 Each anti-intrusion alarm set contains four (4) detector sets, each of which operates on the same RF frequency but with four (4) different code pulses. Each of the four (4) code pulses is also one hundred percent (100%) amplitude modulated with a different modulation frequency. This allows each of the codes to have a different audio tone which increases the discernibility between one detector and another. The four (4) pulse codes, message format, and amplitude modulating (audio tone) frequency is shown in figure 3-2. Each of the detector sets is marked as to the number of pulses which it transmits. Figure C-2 shows a 4 pulse detector, the number of raised dots indicate the number of pulses.

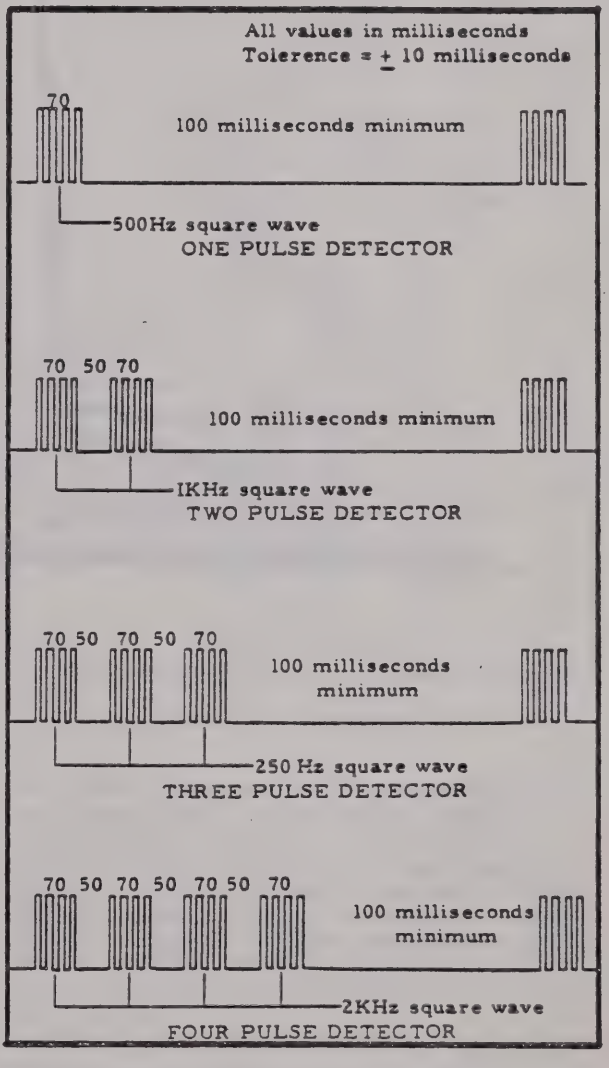


Figure 3-2 Detector Message Format

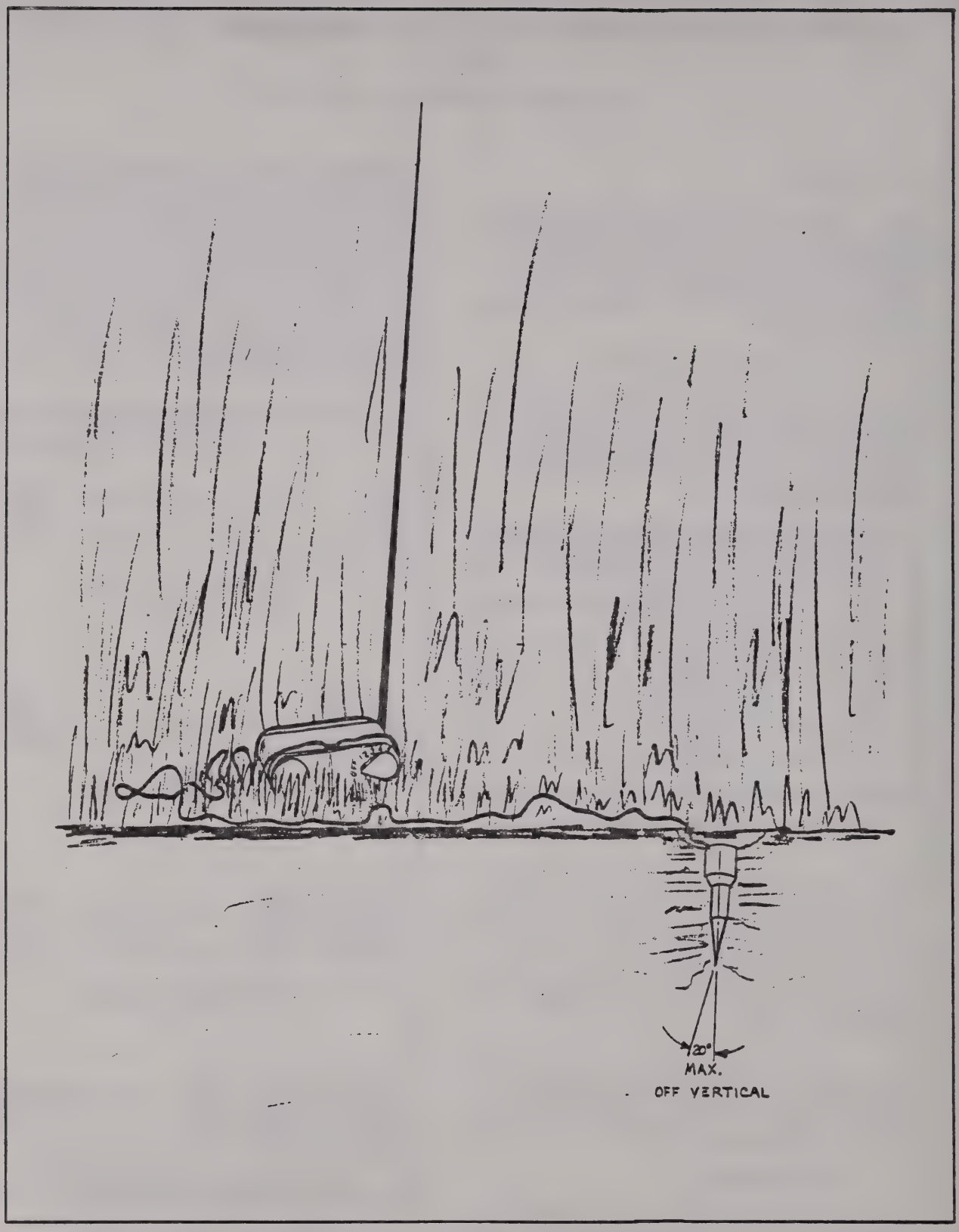


Figure 3-3 Deployment, Detector Set

3-9 The detector sets will be deployed as shown in figure 3-3. The deployment location should be one which has a low level of background noise (background noise is defined as any undesired vibration within the sensitivity range of the detector set, such as high winds, rain, low flying aircraft, and similar sources of seismic disturbances). Some areas which present high levels of background noise would be airfields, heavily traveled roadways, heavily congested areas, and roadways with heavy vehicles traveling as much as a mile from the detector set. Background noise of a sufficient level could cause the detector set to transmit meaningless signals indicating movement in an area where there is none.

3-10 The geophone should be embedded in firm soil, spike down, and within twenty degrees (20°) of the vertical, regardless of the terrain contour, as shown in figure 3-3. The detector set should be deployed as shown in figure 3-3 with the antenna free of obstructions and without any strain on the geophone cable. The on/off sensitivity switch should be set to the position as determined during the checkout (see section IV). Additional adjustment of the on/off sensitivity switch may be necessary due to differences in the conditions of the use area as compared to the conditions of the checkout area. Nominal sensitivity can be seen in figure 3-4. However, these values may change due to dissimilar soil conditions of different use areas.

ON/OFF SENSITIVITY SWITCH POSITIONS	PERSONNEL MOVEMENT (One Person Walking) RANGE
OFF	0 feet 0 meters
1	8 feet 2.6 meters
2	15 feet 4.9 meters
3	50 feet 16.5 meters
4	70 feet 23 meters
5	130 feet 43 meters

Figure 3-4 Nominal Detector Sensitivity

3-11 The geophone senses the movment of personnel and vehicles in the area of the detector. The detector in turn transmits a message format as shown in figure 3-2. The detector, after transmitting the message, will not accept another geophone signal until after the minimum one hundred (100) millisecond off period; then it will transmit the message again. This action will continue until the movement is outside the detector's sensitivity range. If it is desirable to establish the direction of movement, the detectors can be arranged in such a manner where movement from one detector range into another detector range will indicate the direction of travel. Under ideal conditions, the transmitted signal from the detector set will be received a maximum of one (1) mile (1852 meters).

3-12 RECEIVER SET

3-13 The two acceptable configurations in which the receiver set may be utilized are shown in figure 3-5. In the configuration (a), the receiver may be placed on a table, the ground, or held in the hand. The antenna should be free of any obstruction. In the configuration (b), the receiver may be placed in the shirt pocket. CAUTION: The antenna should be on the side away from the body to avoid the possibility of malfunction or poor reception due to body perspiration.

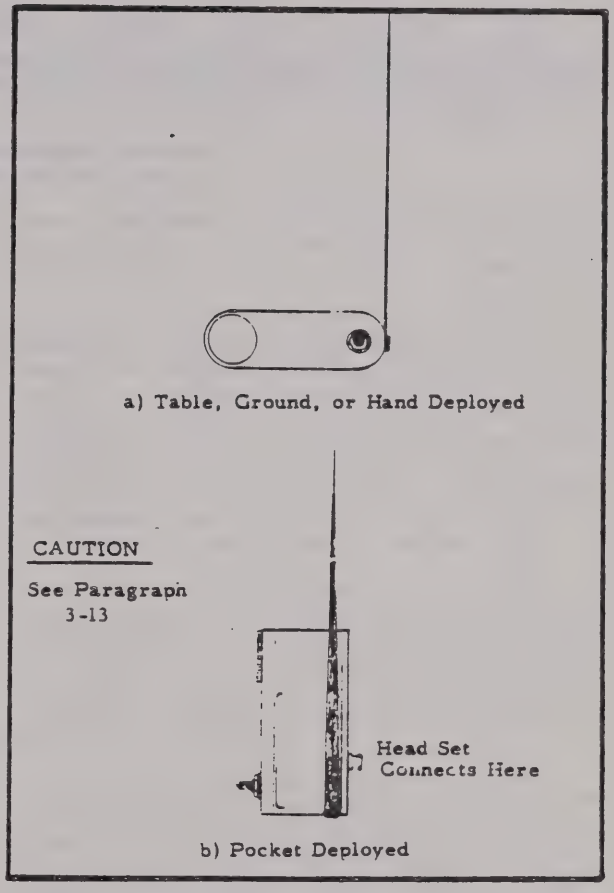


Figure 3-5 Receiver Configuration, While in Use

3-14 When the receiver picks up the transmitted signal, it converts it to a pulsed audio tone which is heard through the headset. An experienced receiver operator will be able to determine which detector is transmitting by the tone, as well as the number of pulses. In place of the headset, a small speaker of the proper impedance may be used, or an amplifier with the proper input impedance may be used in conjunction with the receiver set.

AMBIENT TEMPERATURE (SET NOT IN SUN) °F	DETECTOR SET (HOURS OF BATTERY USE)*		RECEIVER SET (HOURS OF BATTERY USE)* Power On	
	Continuous Activation	No Transmission Set On	Continuous Activation	No Signal Out
140	85	850	45	85
120	95	900	50	95
70	95	900	50	95
32	4	50	2	4
0	2	25	1	2

* Hours to reach 7.0 volts battery voltage. Time to reach 7.5 volts battery voltage is 1/2 the hours shown in this table.

FIG. 3-6 Expected Battery Operational Life
(Using Mercury-Cell Battery BA-1090/U)

SECTION IV

PREPARATION FOR USE

4-1 GENERAL

4-2 This section of the technical manual describes the unpacking, preparation, and checkout of the anti-intrusion alarm set prior to actual use.

4-3 UNPACKING

4-4 Remove the detector sets and receiver set from the carrying cases and remove the clips which are over the end of each unit. Remove the geophone from the clip on the detector, and unwrap the geophone cables. Remove the headset and headband from the carrying case. Connect the headset cable to the receiver set.

4-5 Visually inspect each unit for damage which may have occurred in transit (i.e. broken antenna, cracked case, damaged cable, etc.). Should any damage exist, it will either be repaired or the unit rejected as required by Section V or VI.

4-6 Remove the batteries from their shipping carton. Place the on/off sensitivity switch on the detector sets in the off position, and the on-off switch on the receiver set in the off position. Install the batteries in the detector sets and the receiver set as shown in Section V. Place 10 spare batteries in the Alarm Set carrying case.

4-7 Assure that all detectors of an alarm set are marked with the same RF frequency as the receiver. All four pulse codes should be present. The units with the wrong frequency or pulse code shall be rejected from this alarm set and returned to central supply.

4-8 PREPARATION AND CHECKOUT

4-9 Select a suitable location for the checkout area. The conditions of this area should be similar to those of the actual use area (see Section III).

4-10 Select one of the detector sets and notice the pulse code marked on the detector case. Deploy the detector set in the checkout area as shown in section III. The receiver operator should be located 4 to 5 meters (13 to 16 feet) from the detector set.

4-11 Turn the detector on/off sensitivity switch to position number one (1), and the receiver on-off switch to the on position. If the detector operator does not move, the receiver operator should not hear a signal. If the receiver operator does hear a signal, there is either excessive background noise in the checkout area or the detector set is defective.

4-12 When the detector operator moves within the radius of the detector range shown in section III, the receiver operator should hear a signal. NOTE: he may or may not hear a signal for each movement.

4-13 If the receiver operator hears a signal or signals which match the pulse code marked on the detector set, the position of the on/off sensitivity switch and the distance between the detector set and receiver set should be noted for proper setup when the detector is deployed in the use area. Return the on/off sensitivity switch to the off position. Remove the geophone from the ground. Wipe the case and geophone clean; then return the detector set to the carrying case for transit to the use area.

4-14 If the receiver operator does not hear a signal, set the on/off sensitivity switch to the next higher position and/or decrease the distance between the detector set and receiver set as necessary until the receiver operator hears a signal or signals matching the pulse code marked on the detector case, and repeat paragraph 4-13.

4-15 In all cases, select the switch setting which allows no false signal when the detector operator is not moving, but which gives a signal when the detector operator moves within the detector sensitivity range. If both conditions cannot be met, select the nearest approximations or relocate the checkout area to a location with less background noise.

4-16 Repeat the preceding procedure for each of the detector sets.

SECTION V

MAINTENANCE AND REPAIR

5-1 GENERAL

5-2 This section of the technical manual specifies the preventive maintenance, periodic cleaning and repair actions to be performed in order to maintain a usable item of equipment.

5-3 MAINTENANCE FORMS AND RECORDS

5-4 Maintenance forms, records, and reports which are to be used by maintenance personnel at all maintenance levels are listed and prescribed by TM 38-750.

5-5 PERIODIC CLEANING AND INSPECTION

5-6 At the end of each mission or at the end of 48 hours of continuous operation, whichever comes first, test or replace the batteries. To check the battery voltage, remove the battery cap as shown in this section. Turn the detector on/off sensitivity switch to position 5 and using the multimeter check the battery voltage across the two battery terminals. With the unit operating, the battery voltage should be a minimum of 7.2 volts. The receiver batteries should also be checked with the unit turned on. If the battery voltage is below 7.2 volts, it is doubtful they will last through another mission, and they should be replaced. NOTE: testing mercury cell battery capacity with only a voltmeter is not a reliable method of testing.

5-7 At the end of each mission, inspect each unit for damage (i.e. broken antenna, loose switch knob, damaged cable, etc.). If damage exists which can be repaired, follow the instructions of this section. If the damage is non-repairable, the unit should be rejected (see Section VII).

5-8 At the end of each mission, prior to repacking in the carrying case, each unit should be wiped clean, or if necessary should be washed with water, dried, and then repacked. When washing the units, care should be taken not to damage the antenna, geophone cable, or headset assembly.

5-9 ALARM SET STORAGE

5-10 In order to prevent damage to the alarm set, the units shall be stored without batteries.

5-11 REPAIR OF DETECTOR SETS

5-12 Battery Replacement: The following steps will be performed to replace the batteries:

1) Remove the battery cap by turning counter-clockwise.

2) Carefully remove the batteries from the unit and disconnect from the battery clip.

3) If the battery cushion is loose, it should be reglued inside the detector case with an epoxy type adhesive.

4) Carefully connect the new batteries to the battery clip.

5) Place the batteries back in the detector case.

6) Be sure that the battery gasket is still on the battery cap. Replace the battery cap by turning it in the clockwise direction until snug (finger tight).

5-13 On/Off Sensitivity Switch Knob Replacement: The following steps should be performed to replace this on/off sensitivity switch knob.

1) Using the miniature standard screwdriver, turn the on/off sensitivity switch knob set screw counter-clockwise to loosen.

2) Slide the knob off the shaft.

3) Place the new knob on the shaft. Notice that the shaft has a flat side, and the knob has a corresponding flat on the inside at the point where the set screw comes through. These flats should be aligned, and the knob should be pushed on the shaft to the point where the shaft is to the bottom of the hole in the knob. If this places the knob against the case, the knob should be moved back on the shaft until there is a slight clearance between the knob and the case.

4) Tighten the set screw by turning clockwise until the set screw is tight. Care should be taken not to tighten the screw to the point where the knob threads strip out.

5-14 Antenna Replacement: The following steps should be performed to replace the antenna; refer to figures C-1 and C-2.

1) Using the standard screwdriver, remove the antenna screw by turning counter clockwise.

2) With the removal of the antenna screw, the lock washer, antenna clip and antenna will come off.

3) Replace the antenna; if the antenna clip is also damaged, replace it at this time to avoid damage to the new antenna. NOTE: The unpainted portion of the antenna and all hardware should be cleaned prior to reassembly.

4) Replace the screw and lockwasher and

tighten the screw by turning clockwise. Care should be taken to assure proper alignment of the antenna clip as the screw is tightened.

5-15 Appendix C lists the items which can be replaced on the detector sets, any other damage to parts not shown as replaceable cannot be repaired and the unit should be rejected (see Section VII).

5-16 REPAIR OF RECEIVER SET

5-17 Battery Replacement: The receiver batteries should be replaced as shown in paragraph 5-12.

5-18 Antenna Replacement: The receiver antenna is replaced as shown in paragraph 5-14.

5-19 Appendix C lists the items which can be replaced on the receiver set, any other damage to parts not shown as replaceable cannot be repaired, and the unit should be rejected (see Section VII).

SECTION VI

TROUBLESHOOTING

6-1 GENERAL

6-2 This section of the technical manual provides a list of symptoms, and probable malfunctions, which may be experienced in the use of the anti-intrusion alarm set. Some corrective actions which can be taken are also shown. Due to the design of the units, if the trouble cannot be corrected by the repairs specified in section V, the unit should be rejected (See Section VII).

SYMPTOM	PROBABLE MALFUNCTION	CORRECTIVE ACTION
Weak signal with normal pulse duration from the detector set	Impending battery failure	Replace batteries as shown in Section V
Code changed (i. e. 2 pulse signal instead of normal 3 pulse signal)	Impending battery failure	Replace batteries as shown in Section V
Audio Tone Shift	Impending battery failure	Replace batteries as shown in Section V
Antenna does not stand erect	Antenna may be bent or obstructed	Replace antenna as shown in Section V or remove obstruction
Intermittent operation of detector set	Antenna may be obstructed Damaged geophone cable	Remove obstruction Reject unit
No output from the detector set	Battery failure Antenna obstructed Broken antenna Broken geophone cable Broken battery wire	Replace Battery Remove obstruction Replace antenna Reject unit Splice if possible -- if not, reject
No output from all four detectors	Receiver battery failure	Replace Receiver batteries as shown in Section V
No output from all four detectors, new batteries in the receiver	Receiver headphone or cable damaged	Replace Receiver Headphone
Intermittent operation of all four detectors	Receiver antenna obstructed Damaged headset cable	Remove obstruction Replace headset
On/Off Sensitivity switch knob turns but range does not increase	Loose on/off sensitivity switch knob	Tighten set screw as shown in section V
Water in the battery compartment	Damaged battery gasket	Replace battery gasket dry compartment, then replace batteries
Constant signals received from the detector set with no movement in the detector area.	Background noise level excessive	Move detector set to a location with less background noise

Figure 6-1 Symptoms, Probable Malfunctions, and Corrective Actions

6-3 NOTE: Headset cable and connector should retain their watertight integrity at all times.

SECTION VII

SAFETY AND DEFECTIVE MATERIAL

7-1 GENERAL

7-2 This section of the technical manual specifies the safety precautions necessary, and the procedure for the disposition of defective units of the anti-intrusion alarm set.

7-3 PERSONNEL SAFETY

7-4 There are no special safety precautions required for the normal handling of this equipment, as it has no high voltage and presents no health hazards if the battery is not ruptured. WARNING: DO NOT DISPOSE OF BATTERIES BY BURNING.

7-5 DEFECTIVE MATERIALS

7-6 When it has been determined that a set or part is defective, the following shall be performed:

1) Damaged or unserviceable sets or parts will be disposed of in accordance with AR 755-15. Local disposal is not authorized except in combat areas.

2) Packaging and marking of sets or parts being returned will be at least equal to that for new sets or parts.

3) Sets or parts will not be sold as surplus property.

4) Surplus sets or parts will be reported to the National Inventory Control Point, U. S. Army Mobility Equipment Command, St. Louis, Mo. Attention: AMSME-MTF, to preclude shipment to unauthorized recipients.

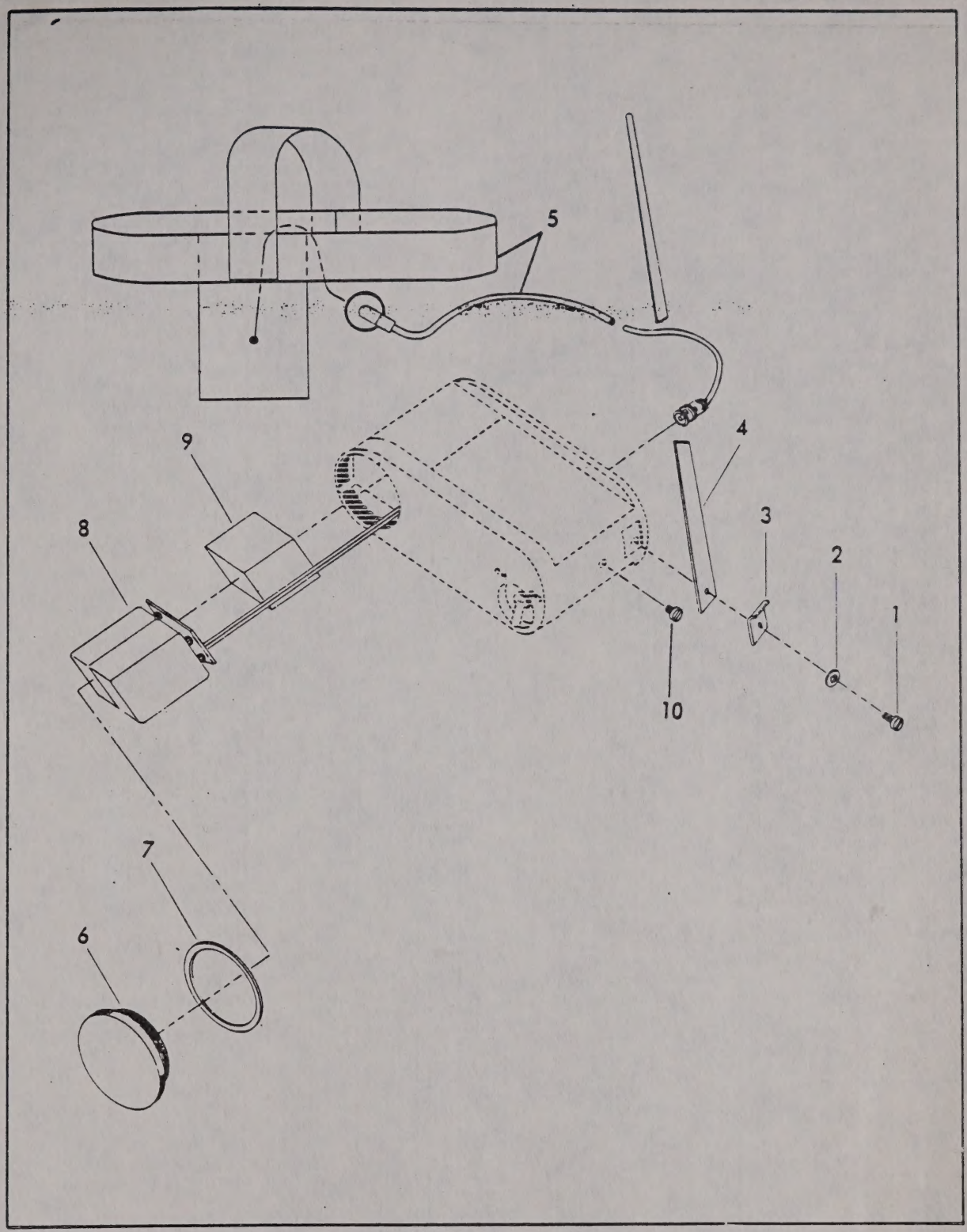


Figure C-1 Receiver Set, Exploded View

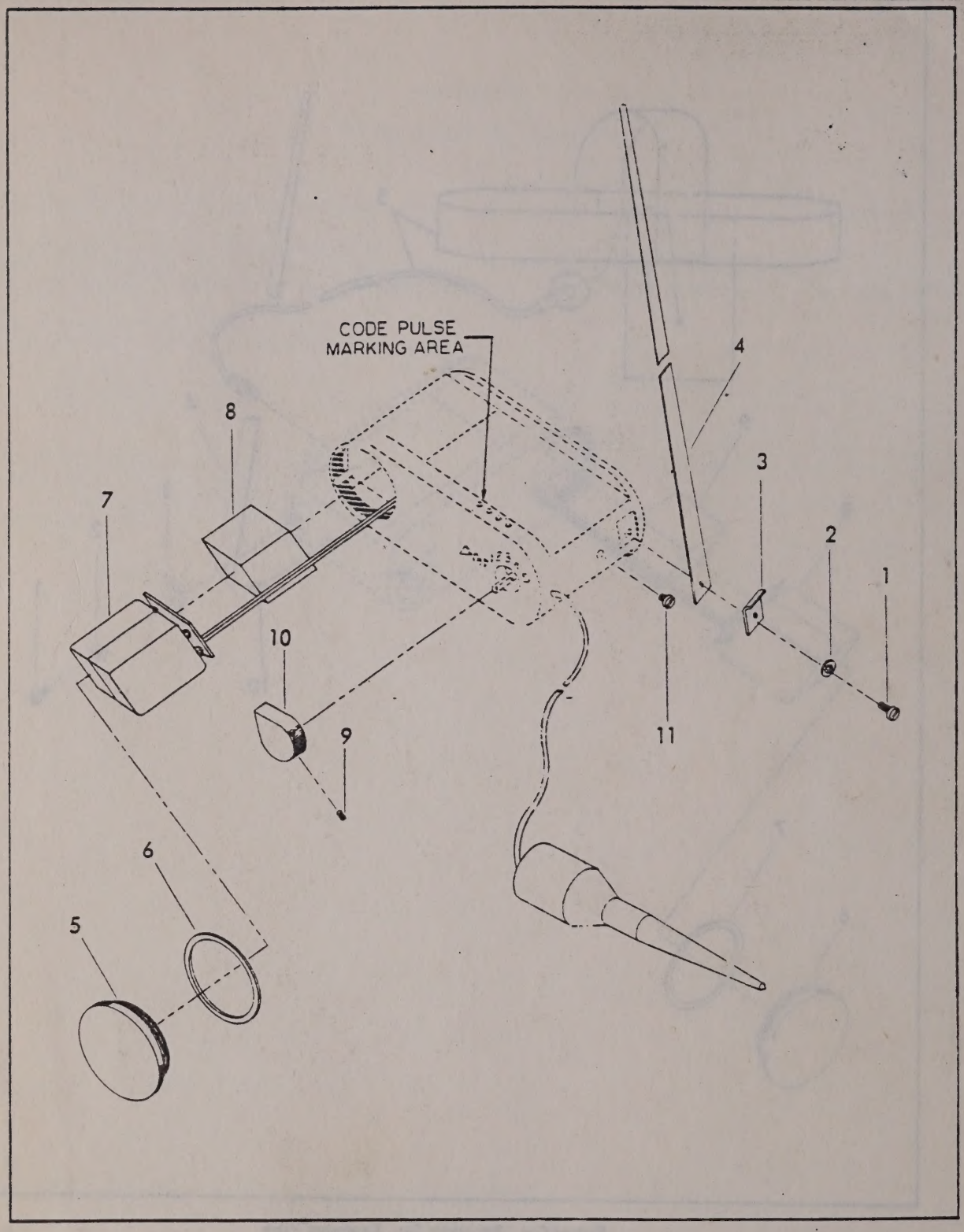


Figure C-2 Detector Set, Exploded View